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A new species of the bee genus *Ctenoplectrella* in middle Eocene Baltic amber (Hymenoptera, Megachilidae)

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Abstract

A new species of the extinct bee genus *Ctenoplectrella* Cockerell (Megachilinae: Ctenoplectrellini) is described and figured from two females preserved in middle Eocene (Lutetian) Baltic amber. *Ctenoplectrella phaeton* **sp. n.** is distinguished from its congeners on the basis of its body proportions, integumental sculpturing, wing venation, and pubescence, and is one of the more distinctive members of the genus. A revised key to the species of *Ctenoplectrella* is provided.

Keywords

Megachilinae, Ctenoplectrellini, paleontology, Tertiary, Eocene, taxonomy

Introduction

The Eocene was the last epoch harboring a truly disparate bee fauna relative to the composition of forms we are so familiar with in today's ecosystems. Following the Eocene-Oligocene transition the bee fauna began to look relatively modern at least

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in terms of the general appearance of the tribes, genera, and subgenera comprising the diversity in the latest Paleogene and Neogene periods. However, from the Eocene and earlier epochs we find regularly taxa that harbor unique combinations of traits that render them challenging to fit amongst their modern counterparts even at higher taxonomic levels, alongside otherwise more modern forms (Engel 1998, 2001, 2004, 2008, 2011, unpubl. data; Wappler and Engel 2003; Engel and Perkovsky 2006; Ohl and Engel 2007; Patiny et al. 2007; Michez et al. 2007, 2009, in press; Wedmann et al. 2009). Those glimpses into the Early Paleogene highlight a diversity of genera and tribes quite distinct, exhibiting not only plesiomorphic features relative to species of today but obviously with unique adaptations and apomorphies which did not persist to the present (e.g., the bizarre facial morphologies of species of *Succinapis* Engel: *vide* Engel 2001). Our knowledge of these remarkable bees continues to grow, mostly from European deposits but now also from distant biogeographic regions such as India (Rust et al. 2010; Engel unpubl. data).

Herein we describe a recently recognized new species of the Eocene bee genus *Ctenoplectrella* Cockerell (1909a, 1909b). The genus was described originally alongside the genus *Glyptapis* Cockerell in a distinct subfamily, Glyptapinae, which Cockerell (1909b) considered to be "near the stem-form of the Megachilidae" but simultaneously indicated that he believed their closest modern relative to be *Ctenoplectra* Smith (hence the name he chose for the group of fossil species considered herein). Cockerell's assertion is difficult to understand given that there is actually little morphological similarity between *Ctenoplectrella* and *Ctenoplectra*, today recognized to be a distinct lineage of Apidae, and even less so between *Glyptapis* and the latter. Engel (2001) provided the first revision of the Eocene bee fauna and recognized *Ctenoplectrella* and *Glyptapis* as definitive megachilids, and at first placed them within the Osmiini, later elevating them both to tribal status alongside the other megachilines (Engel 2005). All four *Glyptapis* species, as well as the known five species of *Ctenoplectrella*, are from Baltic amber (middle Eocene) except for *C. zherikhini* Engel and Perkovsky, which is known from the Late Eocene amber of the Rovno region of the Ukraine (Table 1).

While *Ctenoplectrella* and *Glyptapis* are definite oddities, we have noted a considerable similarity between *Ctenoplectrella* and the rare living genus *Aspidosmia* Brauns [presently in Anthidiini (*vide* Michener 2007), but apparently more basally related among the Megachilinae (Litman et al. in press)], with two species in southern Africa (Brauns 1926; Peters 1972). Both genera share a metatibia with relatively long setae suggesting a scopa and a forewing with a rather elongate prestigma and basal vein strongly arcuate, meeting Cu orthogonally (i.e., at a right angle), and it is likely that they are closely related, with *Aspidosmia* perhaps representing the sole survivors of the ctenoplectrelline lineage. Naturally, this conclusion requires rigorous cladistic testing but is tantalizing given the number of biogeographic connections between the sub-Saharan or East Asian fauna and extinct taxa from the European Paleogene (e.g., Ander 1942; Petrunkevitch 1958; Larsson 1978; Lourenço and Weitschat 1996; Böhme and Weitschat 1998; Engel 2001; Liu and Engel 2010; Weitschat and Wichard 2010).

Table 1. Currently included species in *Ctenoplectrella*.

Species	References
Baltic Amber (Lutetian)	
C. cockerelli Engel, 2001	Engel 2001
C. gorskii Engel, 2008	Engel 2008
C. grimaldii Engel, 2001	Engel 2001
C. phaeton Gonzalez & Engel, sp. n.	Present study
C. viridiceps Cockerell, 1909a	Cockerell 1909a, 1909b; Engel 2001
Rovno Amber (Bartonian-Priabonian?)	
C. zherikhini Engel & Perkovsky, 2006	Engel and Perkovsky 2006

Material and methods

Morphological terminology follows that of Engel (2001) and Michener (2007), while the format for the description generally follows that used by Engel (2001, 2008) and Engel and Perkovsky (2006). Photomicrographs were prepared using a Nikon D1x digital camera attached to an Infinity K-2 long-distance microscopic lens. Measurements were made with an ocular micrometer attached to an Olympus SZX-12 stereomicroscope and are provided for the holotype, with those of the paratype in parentheses.

Systematic paleontology

Tribe Ctenoplectrellini Engel, 2001
Genus *Ctenoplectrella* Cockerell, 1909a

***Ctenoplectrella phaeton* sp. n.**
urn:lsid:zoobank.org:act:0027DEF4-DC4A-46C2-87C4-473120D5BB80
http://species-id.net/wiki/Ctenoplectrella_phaeton
Figs 1–4

Holotype. ♀, AMNH Ba-JVe-161, Baltic amber, middle Eocene (Lutetian). Deposited in the Amber Fossil Collection, Division of Invertebrate Zoology (Entomology), American Museum of Natural History, New York.

Paratype. ♀, on curved edge in same amber piece as holotype and with same repository (Figs 1, 4).

Diagnosis. This species resembles *Ctenoplectrella cockerelli* Engel in the forewing with vein 2rs-m strongly and doubly arcuate, the basal vein confluent with cu-a, the first submarginal cell shorter than the second submarginal cell, and the punctate mesepisternum and terga. However, *C. phaeton* can be distinguished from *C. cockerelli* and

Figure 1. Photograph of majority of amber piece (middle Eocene, Baltic amber) indicating relative positions of two individuals of *Ctenoplectrella phaeton* Gonzalez and Engel, sp. n. (AMNH Ba-JVe-161); holotype is at right, paratype at upper left on curved edge of piece.

remaining species of the genus by its robust body, punctate metepisternum (impunctate in *C. cockerelli*), and much shorter and sparser body pubescence.

Description. *Female*: Total body length 5.77 mm (6.15 mm); forewing length 3.85 mm (3.92 mm). Head slightly wider than long; paraocular carina present; pedicel about as long as combined lengths of first and second flagellomeres; interocellar distance 2.5 times median ocellar diameter, 1.5 times longer than ocellocular distance; ocelloccipital distance about 1.6 times median ocellar diameter. Intertegular distance 1.46 mm. Outer surfaces of pro– and mesotibiae apically with small posterior spine. Prestigma relatively short, slightly more than two times longer than broad (prestigma width measured to its margin); basal vein strongly arcuate, confluent with cu-a; second abscissa of Rs basad 1m-cu by about six times vein width; 2rs-m distad 2m-cu by vein width, 2rs-m doubly arcuate; second submarginal cell slightly longer than first submarginal cell; seven distal hamuli, arranged in a single, evenly-spaced series. Sixth metasomal sternum with broadly rounded apical margin.

Integument in general smooth and shiny between punctures, weakly imbricate laterally on terga. Outer surface of mandible with minute punctures separated by a puncture width or less. Frons with small punctures separated by 1–1.5 times a puncture width, punctures becoming denser towards vertex. Pronotum laterally with minute punctures separated by a puncture width or less. Mesoscutum with small punctures separated by 1–2 times a puncture width (Fig. 2); tegula with

Figures 2–4. Photomicrographs of *Ctenoplectrella phaeton* Gonzalez and Engel, sp. n. (AMNH Ba-JVe-161) in middle Eocene Baltic amber. **2** Dorsal aspect of holotype female **3** Ventral aspect of holotype female **4** Dorsal aspect of paratype female.

minute, scattered punctures; mesoscutellum about as punctate as on mesoscutum. Metanotum impunctate and smooth. Mesepisternum with faint, scattered, larger punctures than on mesoscutum, nearly impunctate anteriorly to omaulus, punctures denser ventrally. Metepisternum more densely punctate than on mesepisternum, punctures separated by a puncture width or less dorsally, punctures sparse ventrally. Propodeum impunctate basally, lateral and posterior surfaces with minute punctures separated by more than two times a puncture width. Metasomal terga with small punctures separated by 1–2 times a puncture width, without distinct

depressed marginal zones; sterna with coarser punctures than on terga, punctures smaller and finer on first sternum.

Color apparently brown, without maculations. Wing membrane hyaline; veins strong and dark brown.

Face with minute, appressed, simple setae not obscuring integument. Mesoscutum and mesoscutellum with scattered, short, simple setae. Mesepisternum with scattered, erect, longer setae (0.5 times median ocellar diameter) than on mesoscutum. Basal area of propodeum without pubescence; lateral and posterior surfaces with minute, sparse setae (integument largely visible among setae). Legs in general with short, scattered, minutely-branched setae (Fig. 3); basitarsi with denser, slightly longer setae than on tibiae; metatibia with scattered, minutely-branched setae (setal length about 1–1.5 times median ocellar diameter). Metasoma with scattered, short (≤ 0.5 times median ocellar diameter), simple, erect to suberect setae on discs; sternal scopa composed of bands of rather sparse, long (2.5–3.0 times median ocellar diameter), erect, simple setae.

Male: Unknown.

Etymology. The specific epithet is taken from Phaeton and treated as a noun in apposition. In Greek mythology Phaeton died when he tried to drive the chariot of the sun across the sky. Phaeton's sisters wept and their tears turned to amber.

Comments. The supraclypeus, clypeus, and mandibles are obscured by dense *Schimmel* (whitish froth of microscopic bubbles resembling mold) in the holotype and by a fracture in the amber piece in the paratype. However, the strong apical tooth and distinct outer ridge of the mandible is barely visible in the holotype, thus suggesting a similar mandibular shape as in other species of *Ctenoplectrella*.

Revised key to species of *Ctenoplectrella*

(updated from Engel and Perkovsky 2006)

1 Forewing 2rs-m strongly and doubly arcuate, thus second submarginal cell more strongly produced toward wing apex along posterior margin; medioapical margin of clypeus straight (shape of clypeus unknown in *C. phaeton*) **2**

– Forewing 2rs-m relatively straight and therefore second submarginal cell not more strongly produced toward wing apex along posterior margin; medioapical margin of clypeus gently convex ..... ***C. viridiceps*** **Cockerell**

2 Forewing basal vein confluent with cu-a; first submarginal cell shorter than second submarginal cell **3**

– Forewing basal vein distad cu-a; first submarginal cell longer than second submarginal cell ..... ***C. gorskii*** **Engel**

3 Mesepisternum impunctate laterally; metasomal terga faintly imbricate **4**

– Mesepisternum with coarse, faint punctures laterally; metasomal terga with small, scattered punctures **5**

4 Propodeal setae long, erect, and branched; tarsal setae fuscous; gena tapering in width from widest above to narrower below..... ..... ***C. zherikhini*** **Engel & Perkovsky**

– Propodeal setae scattered, short, and simple; tarsal setae white or off-white; gena of relatively equal width along its length ..... ***C. grimaldii*** **Engel**

5 Metepisternum punctate; body pubescence distinctly short and sparse..... ..... ***C. phaeton*** **sp. n.**

– Metepisternum impunctate; body pubescence of moderate length, not distinctly short and sparse ..... ***C. cockerelli*** **Engel**

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